

XRD and Diamond PCD Detector Characterization

M. Sagurton (SFA), J. Distel and R. Bartlett (LANL)

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Beamline(s): **U3C/X8A**

Introduction: Los Alamos operates a number of satellite systems that monitor x-ray, gamma ray and particle fluxes in space. The detectors for these systems need to be stable, rad hard and with known response characteristics. Beamlines U3C and X8A are optimized for characterization and calibration of detectors, filters, mirrors, etc, and are being used to test and characterize some of the prototype detectors for the space-based systems.

Methods and Materials: Nine carbon cathode x-ray diodes (XRD) with and without filters, four aluminum XRDs and one diamond photoconductive diode (PCD) were characterized. Their response was measured from ~ 50 eV to 5500 eV using both U3C and X8A. The measurements were made in a calibration chamber that incorporated a calibrated silicon diode reference detector.

Results: The results for the carbon XRDs were generally as expected for these types of detectors. However, there was more variability among the detectors than expected and there were deviations from the expected results in the higher energy range (> 3000 eV) where the x-rays started to penetrate the 0.020-inch thick carbon cathodes. The aluminum cathode XRDs also showed the expected response shape but deviated from previous calibrations. This may be caused by surface contamination. The diamond PCD had several orders of magnitude greater response than the XRDs and the response followed a model calculation quite well.

Conclusions: The main conclusion based on this first use of the U3C/X8A calibration facility is that it will be very useful for detector development and characterization for future space based detector systems.